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DEPARTMENT OF TEACHER EDUCATION

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Secondary School Pupils' and Teachers' Perceptions of Context-led Teaching and Learning of Science.

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Abstract

The study looked at some Zimbabwean students and teachers' perceptions about the use of context based teaching/learning. Questionnaires, teacher reflections and interviews were used to collect data from ten teachers and 350 form three students. The perceptions were sought in relation to the effect of context led teaching on participation, motivation and relevance of science to real life, as well as on conceptual understanding. Most students and teachers viewed the use of the approach positively. The study also revealed that an enabling environment has to be created for the approach to be implemented effectively.

Introduction

Science education has been criticised because the learning of Science has been reduced to learning of concepts, laws and principles without including crucial aspects about epistemology and culture (Gil-Perez, 1996).

Science education has also been criticised because it isolates the students from other domains of knowledge (Fensham, 1982) and hence fails to recognise that a classroom is a socio-cultural environment that influences the learning of Science (Cobern, 1996).

When Science education is viewed as learning of isolated facts and laws, then the subject is taught as truth that can not be questioned (Krugly-Smolksa, 1995).

Modern Science is historically from the west and when implemented in other contexts, it has to recognize the cultural differences that exist otherwise it fails (Cobern, 1991). The Science being learnt should be directly applicable to everyday life problems if the students are to appreciate its usefulness.

Science education in Africa can succeed by taking into account the cultural, traditional beliefs and context of the society it serves (George, 1999). In other words, there is a need to contextualize science education. Contextualization of Science education is linking school science to everyday life and experiences that students may have had or are likely to have (Bennet, 1999; Lubben, Campbell and Dlamini, 1996). Furthermore, the approach provides a framework for scientific concepts to be derived from a familiar and relevant context. The concepts to be learnt should be related to the context. As students interact with the context, they then derive the concepts. This differs from the traditional approach where the concepts are given by the teacher and not learnt by the students using a relevant context. For this interaction between students and context to result in learning, it is important that the context be related to the experiences of the students.

The effectiveness of context led teaching depends on how the students view the approach as a whole. Before the teachers and students are encouraged to adopt this approach, it is important to find out their perceptions about context led teaching. Lubben et. al. (1996) have carried out an investigation on students' views about context led teaching materials. Their results show that contextualization has a potential for encouraging student participation in science lessons. In Zimbabwe, some initiatives have focused on how science learning can be improved.

The ZIM-SCIENCE program introduced low cost materials for rural schools in Zimbabwe (Zimbabwe Ministry of Education and Culture, 1986). These were meant to make it possible for students in rural schools to learn science without complex laboratory facilities. The curriculum developed for this programme was organized in themes that emphasized a practical study of the applications of science and technology currently used in Zimbabwe.

This was an attempt to provide a framework from which teachers and students would derive the relevant scientific concepts and principles from their every day experiences. While the project made use of low cost materials and local science examples, it did not actually go on to show how the teachers could develop science concepts from the given context. In this study, the perceptions of students and teachers on the use of context to derive scientific concepts and principles will be investigated.

Studies that have been done on context based teaching in Zimbabwe mainly focused on how traditional and cultural beliefs can influence the teaching and learning of Science (Shumba, 1996). Context led teaching and learning referred to in this study is based on what is familiar and relevant to the everyday life of the student, whether traditional or modern.

Research questions

1. What are students' perceptions about context led learning in Science?
2. What are teachers' perceptions about context led teaching of Science?

Research Methodology

Sample

Ten science teachers undertaking a postgraduate certificate in education course participated in the research. The teachers were in different schools and had been teaching secondary school science for at least three years. The teachers had limited research experience, and as a result some tutorials on the process of carrying out classroom based research were given. Some context led teaching activities were carried out so as to familiarize the teachers with the context led approach to teaching. Ten form three classes of between 35-40 students each also participated in the research. The classes constituted of students of mixed ability and gender aged between 15-16 years old. Six of the schools were urban and four were rural.

Procedure

During the course the teachers agreed to teach the form three lessons on fermentation, sound energy and conduction, using the context led approach. The contexts chosen for each of the lessons were, traditional beer and maheu [a non-alcoholic brew] brewing (fermentation), mbira keys [traditional musical instrument] (sound energy) and cooler boxes and freezits [frozen drinks packed in plastic] (conduction). Through discussion and in consultation with the lecturers, the teachers developed a guide for self-reflection as well as questionnaires for students.

As the teachers taught the unit using the context led approach, they recorded their observations and views about the lessons. On completion of the unit, they then administered questionnaires to the students. The researchers carried out interviews to get the teachers' perceptions of context led teaching.

Instruments

The research used questionnaires, teachers' reflections, and interviews, to gather data about teachers' and students' perception about the context led approach in teaching/learning science.

The questionnaires and teacher reflections were used to collect data about students' views on context led teaching in terms of:

- i) students' participation,
- ii) motivation and relevance of science to every day life, and
- iii) conceptual understanding.

Interviews were carried out with four teachers randomly selected from the ten involved in the study. The interview further probed teachers' perceptions of the use of context led teaching.

Results and discussion

This section presents and discusses the results obtained from the study. Positive and negative perception about the use of context led teaching are identified and discussed. The first part of the section deals with students' perception, while the second part focuses on teachers' perceptions. Some comparisons between teachers and students' perceptions are also made during the discussion.

(N.B. The names used for students are not real ones)

Students' Perceptions about Context led Teaching

Students' Perceptions in Relation to Participation

It was the opinion of most students that the use of context in teaching science resulted in increased participation both in class and outside class. The students were able to observe and ask about the making of traditional beer in preparation for their lesson on fermentation. Thus even parents and the community at large were involved in the learning process of their children. The level of cooperation in learning science is evident in some of the students' statements such as the following.

Mugove: *Everyone was given a chance to participate. Many people gave many different ideas as of how traditional beer can be made."*

Muchaneta: *I got my mum, dad and granny to participate. I later explained to them about anaerobic respiration and as I explained to them, the concepts also got clearer in my mind"*

From the above statements it can be said that the students' participation allowed them to demonstrate expertise at two levels. Firstly, the students felt that they demonstrated expertise as they explained what they knew from home to their peers and the teacher in class. In the second instance, students saw themselves as experts who could explain the chemical process involved in brewing traditional beer at home using knowledge gained in science lessons.

The students felt that context led teaching helped them to engage in more hands-on activities. In one of the lessons the students made some traditional instruments which they brought to the science class and used them to learn about sound energy. Students felt that such hands-on participation made them to realise that they were important contributors to the lesson. A number of students' comments indicate this.

John: *I enjoyed making apparatus that can be used during science lessons.*

Sipho: *I have played mbira during traditional dances at home so learning about sound energy with reference to mbira was quite interesting. I enjoyed the discussions on how the sound can be changed from one tone to the other. I also enjoyed playing the instruments brought by others.*

The lesson on sound energy often led to a discussion on traditional dances and practices. The students discussed about different types of dances and where around the country these dances were observed. It must, however, be noted that, while participation increased, the activities and discussions that took place were not directly linked to the desired outcomes. For example, the discussion about traditional dances appeared not to be directly related to the concept of sound energy.

Contrary to the above views, some students felt that it was the role of the teacher to give them the information to be learnt. Unlike the previous group of students, these students did not view themselves as experts and important contributors to the lesson. Traditional teaching approaches seldom encourage students to participate actively in lessons. Because of this some students appear to feel uncomfortable when required to participate more actively. Research has, however, shown that if students participate more in activities, their understanding of science ideas is enhanced (Roth and Roychoudhury, 1993).

Students said that they wanted to participate more in the lessons because they were talking of things that were familiar to them and things that mattered to their everyday life. For example one of the students said:

Zenzo: *I enjoyed all the lessons because I knew what the teacher was talking about. I like talking about the things I have seen and used.*

This comment seems to indicate that students perceive their increased participation as a result of the motivation they get from the relevance of using context. Students' perceptions in relation to motivation and relevance are discussed in the following section.

Students Perceptions in Relation to Motivation and Relevance to Everyday Experiences.

Students felt that the use of the context led approach motivated them to learn science and was relevant to their everyday experiences. For example, according to the students, the use of the process of brewing traditional beer and maheu as a context captured their attention as it made them want to find more about a process that they already knew. This is evident in some of the students' comments as shown below.

Rudo: *The lesson was very interesting. Learning about anaerobic respiration in maheu and beer brewing was quite fun.*

The lesson on conduction using freezits was also seen as very relevant to the students' everyday experiences. After the lesson, the students said that they were not only able to explain conduction but were also able to use the concept to explain their every day experiences as captured in the following statements.

Thutani: *I was familiar with the cooler box because I sell freezits in it at home but I did not know how the cooler box made it possible for my freezits to stay frozen.*

Thandi: *I enjoyed discussing about freezits because I drink them every day. Its nice to talk about things you see and use everyday"*

From the students' comments, it can be said that there is a strong relationship between the familiarity of the situation and the motivation to learn science. If the context is familiar and relevant to the students' everyday experiences, students are likely to have more interest in learning.

Few of the students, however, felt that the use of context was not relevant in today's technologically changing world. These students felt that the approach was not an exciting way to learn science. For example some of the students said:

Ben: *The lesson was quite boring. Maheu is disgusting. I prefer to learn from a textbook. I find textbooks clearer and clean.*

Urimbo: *Science should be used to explain everyday situations but trying to use everyday situations to explain Science concepts is a non-starter.*

The above perceptions relate to notions of traditional forms of instruction which focus on science being taught in the laboratory and not being related to real life situations.

Forms of instruction that students and teachers are used to in Zimbabwe usually do not allow them to explore science in real world contexts.

Students' Perceptions in relation to Conceptual Understanding

An analysis of the students statements also indicated that context led teaching helped them to understand science ideas better. This appears to have been caused by the fact that what they did in class was related to everyday life.

The students felt that use of context allowed them to do the same investigations they had done in class when they were at home. According to the students these further investigations at home helped them understand the scientific ideas better. This is unlike traditional laboratory experiences where science investigations are only restricted to the laboratory. The students also indicated that it became much easier to understand the explanations in the textbook after the lesson using context. In this way textbooks were only used to consolidate what had been learnt in class. For example some of the students said:

Muchaneta: *This lesson helped me a lot because I can remember what we do in every day life than what is in the textbook. If I combine the two, I find it much easier to understand the concepts.*

Students felt that if they use ideas they learn in science to explain things at home, their understanding of concepts improved. Some students, however, felt that they would understand concepts better if the context was left out. They indicated that the contexts used were not found in the syllabus hence they were a waste of time.

An example of such a perception can be seen in the following statement from one of the students.

Zhazha: *I did not understand how we were supposed to use freezits in relation to learning Science. I would prefer to use laboratory apparatus and chemicals.*

In relation to this students further pointed out that such approaches over simplify science and present it as a shallow subject. The implication from this is that some students believe they can understand concepts better if the learning situation is directly related to what will be examined. According to these students, the use of context introduces distracters that prevent them from learning the expected concepts.

Other Emerging Issues Relating to Students' Perceptions

Views about science

One interesting issue that emerged from this research related to how students viewed the nature of science and how it should be taught.

The use of non-poisonous substances like sadza, was seen as a way of providing a safe working environment. Given such an environment, students felt that they would not hesitate to carry out investigations on their own. This appears to imply that, in some ways, the use of context led teaching removed the fear normally associated with carrying out investigations in science. It can, therefore, be said that context led teaching provides favourable learning environments for science.

Some students did not like all the lessons based on context because they associated the learning of science with chemicals and not materials from home. They said they did not enjoy the lesson because there were no experiments with chemicals. This generally shows that the students have always been taught science using laboratory chemicals. As a result they end up believing that science is all about chemicals and apparatus in the lab, and has no relevance to everyday life.

Tom: *I did not enjoy the lesson. There was no Science during the lesson. Just discussing instruments we had made at home and materials we had brought from home does not feel like science. I prefer using things from the laboratory.*

In context led teaching there is need for the teacher to ensure that students continue to refocus on the development of desired concepts. If this does not happen some students may loose direction and focus on other things. Another perception that came from the students was the belief that things related to African traditions are always non-scientific. They felt that it was unusual and unacceptable to talk about African traditions in a science class.

Amos: *I dislike setting up experiments based on African traditions.*

This further confirms students' belief that science can only be learnt in the laboratory at school. Because of their socio-cultural background, some students may fail to relate to the context used and in this way fail to derive concepts from it.

Teachers' Perceptions About Context led Teaching and Participation

Similar to the students, most teachers also positively viewed the use of context led teaching in science. The teachers reported that the science lessons became lively and students actively participated in class discussions. Even withdrawn students were said to have actively participated in the discussions. According to the teachers, the activities that students did at home enhanced classroom participation. This was a result of the fact that students brought varied ideas from different socio-cultural backgrounds.

Also related to the issue of participation was the variation in the degree of participation with respect to gender depending on the type of context used. The teachers noted that for lessons like beer and maheu making, the girls were more active than the boys, while the boys participated more in lessons on making musical instruments. This is most probably caused by the cultural differentiation of gender roles. For all pupils to participate it may, therefore, be necessary to use a variety of contexts. Teachers pointed out that the process of teaching became a cooperative activity as students, parents and the teachers all contributed. According to the teachers this cooperation led to resources for teaching science being easily mobilized. Most teachers concluded that as a result of this, context led teaching made it cheap to run science lessons. The use of context would, therefore, be beneficial in situations where resources are difficult to get.

Teachers' Perceptions in Relation to Motivation and Relevance to Everyday Life

The teachers said that they enjoyed teaching the context led lessons because the concepts became less abstract and less difficult to explain. According to them, this was caused by the fact that all lessons began with settings that were familiar to the students.

The teachers observed that the students began to appreciate the importance of science in their communities and everyday life. For example, in the maheu and beer brewing contexts, the students were able to compare the differences between the processes that were used to make each of these two. The teachers noted that the use of contexts that students are familiar with, helped to achieve a relaxed classroom environment and hence the students were motivated to learn science.

Teachers Perceptions in Relation to Conceptual Understanding

Some teachers felt that context led teaching did not necessarily enhance students' conceptual understanding. One major concern that the teachers noted was that the while students were able to describe processes, for example, in beer brewing, they were unable to give the scientific explanations. This was a concern because increased participation and motivation did not necessarily lead to conceptual understanding. As we indicated earlier on, when using context led teaching there is need for teachers to ensure that the activities done by students are continually redirected to focus on the derivation of intended concepts.

Teachers' understanding of context led teaching

Some teachers showed that they had a limited understanding of context led teaching even after the semester discussions. These teachers felt that students who had no experience of rural life may have difficulties in understanding the context. This appears to show teachers' limited understanding of context led teaching.

In context led teaching it is the role of the teacher to make sure that the context they are using is familiar to the students. The context does not have to be rural or traditional all the time. At the same time, in multicultural schools, it may be difficult to find a context that is familiar to all the students. Any context that the student can relate to would, however, be useful.

The other problem that the teachers indicated was that not all topics could be taught using context. They indicated that most facts being taught in science are of western origin and so there are not enough related contexts in the local environment. The teachers felt that focusing solely on context would result in limited syllabus coverage. This idea tends to confirm the idea that teachers, like their students, tend to feel more comfortable if the teaching of concepts is directed towards what is to be examined.

Some teachers felt that context led teaching does not meet human resource needs of modern industry. Like some of their students, they also felt that the use of context trivialized the science subjects. They also indicated that their students would not be recognized internationally if they were taught in context. They said such graduates would only be useful and recognized in Zimbabwe. This appears to be in line with students' belief that things that are cultural cannot be used to teach science. All these concerns seem to arise from limited understanding of what context led teaching is all about. Once the chosen context is related to the relevant science concepts, then the students should be able to learn the same concepts that students in any other context would have learnt.

Need for teacher professional development

The teachers felt that if the context led approach was to be successfully used by teachers, in- service support would be necessary so as to develop the necessary skills in teachers.

They felt that the approach placed certain demands on them which required careful thought of the lesson.

The teachers said that the approach required them to put their textbooks aside and think of the contexts that could be used in the teaching of science. For example, one of the teachers said:

"I found that thinking about the topic contextually during the lesson planning brought in amazingly new insights into exactly what I had to teach."

Teachers expressed that they did not have enough experience to handle context led teaching because of the varied issues that can emanate from such an approach. They also indicated that inclusion of some examples of context in the syllabus would help the teachers a lot. Some recommended that exemplary materials would help them to implement the strategies very well.

Conclusion

This study looked at how some Zimbabwean students and teachers view the use of context in the teaching/learning of science. The study is significant in that the views emanate from actual experiences of the use of context. Apart from contributing to the development of science education in general, the knowledge obtained in the study should also form a basis for the development of further studies. From the results obtained in this study, it can be seen that some teachers and pupils view context as a solution to the problems faced in the teaching and learning of Science. From the responses of this group it can be seen that the context can help to improve understanding of science concepts, motivation to learn science and relevance of science to everyday life. The revelation that the use of context helps to mobilize resources more easily is of great significance especially in developing countries where resources are expensive.

The negative perceptions which some students and teachers have appear to emanate from a limited understanding of what the context led approach involves.

It is, therefore, important to deal with these attitudes before the teachers and students are expected to accept the approach. In view of this, it is very important to provide adequate teacher support before teachers can use context in the teaching of science. Curricula that support the use of such an approach would also need to be put in place.

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An Investigation i
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Abstract

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Introduction

Reading is an important means b
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particularly important in the Zimbab
of instruction from grade four onward



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